

Table 2-1: Summary of Estimated Risks, West Lake Landfill Operable Unit 1

Exposure Scenario	Radionuclides	Carcinogenic Chemicals	Risks Total Cancer Risks	Non-Carcinogenic Hazard Index
Current Exposures				
<u>Onsite</u>				
Groundskeeper adjacent to Area 1	1×10^{-5}	No exposure	1×10^{-5}	No exposure
Groundskeeper adjacent to Area 2	4×10^{-5}	No exposure	4×10^{-5}	No exposure
<u>Offsite</u>				
Ford Property Groundskeeper	6×10^{-7}	No exposure	6×10^{-7}	No exposure
Future Exposures				
<u>Onsite</u>				
Area 1 Groundskeeper	6×10^{-5}	2×10^{-7}	6×10^{-5}	0.0059
Area 2 Groundskeeper	2×10^{-4}	3×10^{-8}	2×10^{-4}	0.0022
Area 1 Adjacent Building User	1×10^{-5}	No exposure	1×10^{-5}	No exposure
Area 2 Adjacent Building User	4×10^{-5}	No exposure	4×10^{-5}	No exposure
Area 1 Storage Yard Worker	1×10^{-4}	No exposure	1×10^{-4}	No exposure
Area 2 Storage Yard Worker	4×10^{-4}	No exposure	4×10^{-4}	No exposure
<u>Offsite</u>				
Ford Property Groundskeeper	2×10^{-6}	No exposure	2×10^{-6}	No exposure

Table 3-1 : Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart A, Standards for the Control of Residual Radioactive Material from Inactive Uranium Processing Sites	Radon-222	Air	The annual average release rate of radon-222 to the atmosphere applied over the entire surface of a disposal site should not exceed 20 pCi/m ² -s, and the annual average concentration of radon-222 in air at or above any location outside the disposal site should not be increased by more than 0.5 pCi/L.	Not applicable but potentially relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. The radiologically impacted materials at the West Lake site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Therefore, the waste materials at West Lake Site are not similar to uranium mill tailings. These regulations are applicable to uncontrolled areas whereas the current and future uses of Areas 1 and 2 are restricted. As these regulations address radon emissions, which is an issue for OU-1, they are considered potentially relevant and appropriate.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart A, Standards for the Control of Residual Radioactive Material from Inactive Uranium Processing Sites	Radium, Uranium, and trace metals	Ground-water	<p>Establishes maximum concentration of constituents for groundwater protection.</p> <p>Maximum constituent concentration</p> <p>Combined Ra₂₂₆ and Ra₂₂₈ 5 pCi/l</p> <p>Combined U₂₃₄ and U₂₃₈ 30 pCi/l</p> <p>Gross alpha (excluding radon & uranium) 15 pCi/l</p> <p>Arsenic 0.05 mg/L</p> <p>Barium 1.0 mg/L</p> <p>Cadmium 0.01 mg/L</p> <p>Chromium 0.05 mg/L</p> <p>Lead 0.05 mg/L</p> <p>Mercury 0.002 mg/L</p> <p>Selenium 0.01 mg/L</p> <p>Silver 0.05 mg/L</p> <p>Nitrate (as N) 10 mg/L</p> <p>Molybdenum 0.1 mg/L</p>	Not applicable but potentially relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. As potential leaching of radionuclides and trace metals from the radiologically impacted materials at West Lake is a possible issue of concern, these standards are potentially relevant and appropriate.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart B, Standards for Cleanup of Land and Buildings Contaminated with Residual Radioactive Materials from Inactive Uranium Processing Sites	Radium-226 (Radium-228)	Soil	Residual concentrations of radium-226 in soil at a designated uranium processing site should not exceed background by more than 5 pCi/g in the top 15 cm of soil or 15 pCi/g in each 15 cm layer below the top layer, averaged over an area of 100 m ² . (Similar limits are indirectly indicated for radium-228 in Subpart E, which addresses thorium by-product material.)	<p>Neither applicable nor relevant and appropriate to Areas 1 and 2</p> <p>Potentially relevant and appropriate for radiologically impacted soil on the buffer zone/Crossroad prop.</p>	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. The radiologically impacted materials at the West Lake site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Therefore, the waste materials at West Lake Site are not similar to uranium mill tailings. These regulations are applicable to uncontrolled areas whereas the current and future uses of Areas 1 and 2 are restricted. Consequently, these regulations are not relevant and appropriate to Areas 1 and 2. They are potentially relevant and appropriate for the radiologically impacted soil on the buffer zone/Crossroad property.

Table 3-1 : Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart D, Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as amended; Subpart E, Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of the Atomic Energy Act of 1954, as amended	Radiation	Any	Processing operations during and prior to the end of the closure period at a facility managing uranium and thorium by-product materials should be conducted in a manner that provides reasonable assurance that the annual dose equivalent does not exceed 25 mrem to the whole body, 75 mrem to the thyroid, and 25 mrem to any other organ of any member of the public as a result of exposures to the planned discharge of radioactive material to the general environment (excluding radon-222, radon-220, and their decay products).	Neither applicable nor relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. The radiologically impacted materials at the West Lake site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Therefore, the waste materials at West Lake Site are not similar to uranium mill tailings. As alpha and gamma radiation is a potential exposure route for OU-1, these regulations are considered to be potentially relevant and appropriate.
OSWER Directive No. 9200.4-25	Radium-226 Radium-228 Thorium-230 Thorium-232	Soil	Clarifies EPA's position on the use of the soil cleanup criteria in 40 CFR Part 192 at CERCLA sites with radioactive contamination. In particular it clarifies the intent of 40 CFR Part 192 in setting remediation levels for subsurface soil. Also, Thorium-230 and Thorium-232 should be cleaned-up to the same concentrations as their radium progeny. (5 and 15 pCi/g).	Not an ARAR but potentially a TBC for the buffer zone/Crossroad prop.	As this is only guidance, it is not an ARAR. As 40 CFR 192 is considered to be potentially relevant and appropriate for the radiologically-impacted soil on the buffer zone/Crossroad property, this guidance would be a TBC for alternatives that include excavation of soil from these properties.
National Emissions Standards for Hazardous Air Pollutants (40 CFR 61), Subpart T, National Emissions Standards for Radon Emissions from the disposal of Uranium Mill Tailings	Radon-222	Air	Radon-222 emissions to ambient air from uranium mill tailings piles that are no longer operational should not exceed 20 pCi/m ² -s.	Potentially relevant and appropriate	The West Lake Landfill OU-1 Site is not a designated uranium mill tailings site, so this requirement would not be applicable; however it could be considered relevant and appropriate because a portion of the waste materials at the Site do emit radon.
Missouri Radiation Regulations; Protection Against Ionizing Radiation (19 CSR 20-10.040), Maximum Permissible Exposure Limits	Radiation	Any	For persons inside a controlled area, the maximum permissible whole-body dose due to all external sources of radiation within a controlled area is limited to 5 rems/year and 3 rems per quarter for the whole body, head and trunk; major portion of the bone marrow, gonads or lens of eye; 30 rems/year and 10 rems/quarter for the shin; and 75 rems/yr and 25 rems/quarter for the hands/forearms and feet/ankles. (Note: a controlled area is an area that requires control of access, occupancy, and working conditions for radiation protection purposes.)	Potentially relevant and appropriate	As these regulations address sources of ionizing radiation, they are not applicable; however, as they provide standards for protection from radiation, they are potentially relevant and appropriate. These regulations may be relevant and appropriate to the protection of workers inside of Areas 1 and 2 during any remedial actions that may be undertaken.

Table 3-1 : Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks																																				
Missouri Radiation Regulations; Protection Against Ionizing Radiation (19 CSR 20-10.040), Maximum Permissible Exposure Limits	Radiation	Any	For persons outside a controlled area, the maximum permissible whole-body dose due to sources in or migrating from the controlled area is limited to 2 mrem in any 1 hour, 0.1 rem in any 7 consecutive days, and 0.5 rem in any 1 year. (Notes: a controlled area is an area that requires control of access, occupancy, and working conditions for radiation protection purposes; 0.5 rem = 500 mrem.)	Potentially relevant and appropriate	As these regulations address sources of ionizing radiation, they are not applicable; however, as they provide standards for protection from radiation, they are potentially relevant and appropriate. These regulations may be relevant and appropriate to the protection of the public outside of Areas 1 and 2 during any remedial actions that may be undertaken.																																				
Missouri Radiation Regulations; Protection Against Ionizing Radiation (19 CSR 20-10.040), Maximum Permissible Exposure Limits	Specific radionuclides (see table)	Air	<div><div>The concentrations above natural background of radionuclides in air outside a controlled area, averaged over any calendar quarter, should not exceed the following limits:</div><table><tr><th colspan="3">Concentration Limit (uCi/mL)</th></tr><tr><th>Isotope</th><th>Soluble</th><th>Insoluble</th></tr><tr><td>Actinium-227</td><td>8 x 10-14</td><td>9 x 10-13</td></tr><tr><td>Lead-210</td><td>4 x 10-12</td><td>8 x 10-12</td></tr><tr><td>Protactinium-231</td><td>4 x 10-14</td><td>4 x 10-12</td></tr><tr><td>Radium-226</td><td>1 x 10-12</td><td>6 x 10-9</td></tr><tr><td>Radium-228</td><td>2 x 10-12</td><td>1 x 10-12</td></tr><tr><td>Radon-222</td><td>1 x 10-9</td><td>NA</td></tr><tr><td>Thorium-230</td><td>8 x 10-14</td><td>3 x 10-13</td></tr><tr><td>Thorium-232</td><td>7 x 10-14</td><td>4 x 10-13</td></tr><tr><td>Uranium-235</td><td>2 x 10-11</td><td>4 x 10-12</td></tr><tr><td>Uranium-238</td><td>3 x 10-12</td><td>5 x 10-12</td></tr></table><div>NA = not applicable because radon-222 is a gas.</div></div>	Concentration Limit (uCi/mL)			Isotope	Soluble	Insoluble	Actinium-227	8 x 10-14	9 x 10-13	Lead-210	4 x 10-12	8 x 10-12	Protactinium-231	4 x 10-14	4 x 10-12	Radium-226	1 x 10-12	6 x 10-9	Radium-228	2 x 10-12	1 x 10-12	Radon-222	1 x 10-9	NA	Thorium-230	8 x 10-14	3 x 10-13	Thorium-232	7 x 10-14	4 x 10-13	Uranium-235	2 x 10-11	4 x 10-12	Uranium-238	3 x 10-12	5 x 10-12	Potentially applicable	These requirements would be applicable to protection of the public during implementation of any remedial action. Specifically, these regulations potentially may require perimeter monitoring to be undertaken during any activities that may expose or disturb the radiologically-impacted materials at the Site.
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Missouri Public Drinking Water Program - Contaminant Levels and Monitoring (10 CSR 60-4)	Inorganics, Synthetic Organic Compounds, Radionuclides, Secondary Contaminants, and Volatile Organic Compounds		<div>Maximum contaminant levels for public water systems.</div> <table><tr><th colspan="2">Maximum Contaminant Levels</th></tr><tr><th>Inorganics</th><th></th></tr><tr><td>Antimony</td><td>0.006 mg/L</td></tr><tr><td>Arsenic</td><td>0.05 mg/L</td></tr><tr><td>Asbestos</td><td>7 x 10⁶ fibers/L</td></tr><tr><td>Barium</td><td>2 mg/L</td></tr><tr><td>Beryllium</td><td>0.004 mg/L</td></tr><tr><td>Cadmium</td><td>0.005 mg/L</td></tr><tr><td>Chromium</td><td>0.1 mg/L</td></tr><tr><td>Cyanide</td><td>0.2 mg/L</td></tr><tr><td>Fluoride</td><td>4.0 mg/L</td></tr><tr><td>Mercury</td><td>0.002 mg/L</td></tr><tr><td>Nitrate (as N)</td><td>10 mg/L</td></tr><tr><td>Nitrite (as N)</td><td>1 mg/L</td></tr><tr><td>Total Nitrate + Nitrite (as N)</td><td>10 mg/L</td></tr><tr><td>Selenium</td><td>0.01 mg/L</td></tr><tr><td>Thallium</td><td>0.002 mg/L</td></tr></table>	Maximum Contaminant Levels		Inorganics		Antimony	0.006 mg/L	Arsenic	0.05 mg/L	Asbestos	7 x 10 ⁶ fibers/L	Barium	2 mg/L	Beryllium	0.004 mg/L	Cadmium	0.005 mg/L	Chromium	0.1 mg/L	Cyanide	0.2 mg/L	Fluoride	4.0 mg/L	Mercury	0.002 mg/L	Nitrate (as N)	10 mg/L	Nitrite (as N)	1 mg/L	Total Nitrate + Nitrite (as N)	10 mg/L	Selenium	0.01 mg/L	Thallium	0.002 mg/L	Not applicable Potentially relevant and appropriate	These standards apply to public water systems and therefore are not applicable to the West Lake Landfill. As these standards provide for maximum concentrations in drinking water and the alluvial aquifer could be used for drinking water outside of the West Lake landfill boundaries; these standards are potentially relevant and appropriate for groundwater at the Site.		
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Table 3-1 : Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Missouri Public Drinking Water Program - Contaminant Levels and Monitoring (10 CSR 60-4) (cont.)	Maximum Contaminant Levels				
	<u>Synthetic Organic Compounds</u>				
	Alachlor		0.002 mg/L		
	Atrazine		0.003 mg/L		
	Benzo(a)pyrene		0.0002 mg/L		
	Carbonfugran		0.04 mg/L		
	Chlordane		0.002 mg/L		
	Dalapon		0.2 mg/L		
	Di(2-ethylhexyl) adipate		0.4 mg/L		
	Dibromochloropropane (DBCP)		0.0002 mg/L		
	Di(2-ethylhexyl) phthalate		0.006 mg/L		
	Dinoseb		0.007 mg/L		
	Diquat		0.02 mg/L		
	Endothall		0.1 mg/L		
	Endrin		0.002 mg/L		
	2,4-D		0.07 mg/L		
	Ethylene dibromide (EDB)		0.00005 mg/L		
	Glyphosate		0.7 mg/L		
	Heptachlor		0.0004 mg/L		
	Heptachlor Epoxide		0.0002 mg/L		
	Hexachlorobenzene		0.001 mg/L		
	Hexachlorocyclopentadiene		0.05 mg/L		
	Lindane		0.0002 mg/L		
	Methoxychlor		0.04 mg/L		
	Oxamyl (Vydate)		0.2 mg/L		
	Picloram		0.5 mg/L		
	Polychlorinated biphenyls (PCBs)		0.0005 mg/L		
	Pentachlorophenol		0.001 mg/L		
	Simazine		0.004 mg/L		
	Toxaphene		0.003 mg/L		
	2,3,7,8-TCDD (Dioxin)		0.00000003 mg/L		
	2,4,5-TP (Silvex)		0.05 mg/L		
	<u>Radionuclides</u>				
	Combined Ra ₂₂₆ and Ra ₂₂₈		5 pCi/l		
	Gross alpha (excluding radon & uranium)		15 pCi/l		
	Uranium		30 ug/L		
	<u>Secondary Contaminants</u>				
	Aluminum		0.05 - 0.2 mg/L		
	Chloride		250 mg/L		
	Copper		1.0 mg/L		
	Fluoride		2.0 mg/L		
	Iron		0.3 mg/L		
	Manganese		0.05 mg/L		
	Silver		0.1 mg/L		
	Sulfate		250 mg/L		
	Total Dissolved Solid (TDS)		500 mg/L		
	Zinc		5 mg/L		

Table 3-1 : Preliminary Identification of Potential Chemical-Specific ARARs and TBC Criteria

Citation	Chemical	Medium	Requirement	Preliminary Determination	Remarks
Missouri Public Drinking Water Program - Contaminant Levels and Monitoring (10 CSR 60-4) (cont.)	Maximum Contaminant Levels				
	<u>Volatile Organic Compounds</u>				
	Benzene		0.005 mg/L		
	Carbon tetrachloride		0.005 mg/L		
	1,2-dichloroethane		0.005 mg/L		
	1,1-dichloroethylene		0.007 mg/L		
	para-dichlorobenzene		0.075 mg/L		
	1,1,1-trichloroethane		0.2 mg/L		
	Trichloroethylene		0.005 mg/L		
	Vinyl chloride		0.002 mg/L		
	cis-1,2-dichloroethylene		0.07 mg/L		
	Dichloromethane		0.005 mg/L		
	1,2-dichloropropane		0.005 mg/L		
	Ethylbenzene		0.7 mg/L		
	Monodichlorobenzene		0.1 mg/L		
	o-dichlorobenzene		0.6 mg/L		
	Styrene		0.1 mg/L		
	Tetrachloroethylene		0.005 mg/L		
	Toluene		1 mg/L		
	1,2,4-Trichlorobenzene		0.07 mg/L		
	1,1,2-Trichloroethane		0.005 mg/L		
	trans-1,2-dischloroethylene		0.1 mg/L		
	Xylenes (total)		10 mg/L		

Table 3-2 : Preliminary Identification of Potential Location-Specific ARARs and TBC Criteria

Citation	Location	Requirement	Preliminary Determination	Remarks
Archeological and Historic Preservation Act (16 USC 469; PL 93-291; 88 Stat. 174)	Land	Data recovery and preservation activities should be conducted if prehistoric, historical, and archaeological data might be destroyed as a result of a federal, federally assisted, or federally licensed activity or program.	Potentially applicable	No destruction of such data is expected to result from remedial action. The site has been considerably disturbed by past human activities and is therefore not expected to contain any such data. However, if these data were affected, e.g., at any potential off-site borrow area, the requirement would be applicable.
Endangered Species Act, as amended [16 USC 1531-1543; 50 CFR 17.402; 40 CFR 6.302(h)]	Any	Federal agencies should ensure that any action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of any threatened or endangered species or destroy or adversely modify any critical habitat.	Potentially applicable	No critical habitat has been identified in the affected area, and no adverse impacts to threatened or endangered species are expected to result from any remedial action. However, if such species were affected, the requirement would be applicable. A biological assessment was conducted during preparation of the Baseline Risk Assessment. No federal listed or proposed threatened and endangered species and their habitats were identified.
Missouri Wildlife Code (1989) (RSMo. 252.240;3 CSR 10-4.111), Endangered Species	Any	Endangered species, i.e., those designated by the U.S. Department of the Interior and the Missouri Department of Conservation as threatened or endangered (see 1978 Code, RSMo. 252.240), should not be pursued, taken, possessed, or killed.	Potentially applicable	No critical habitat has been identified in the affected area, and no adverse impacts to threatened or endangered species are expected to result from any remedial action. However, if such species were affected, the requirement would be applicable.
Floodplain Management [Executive Order 11988; 40 CFR 6.302(b)]	Floodplain	Federal agencies should avoid, to the maximum extent possible, any adverse impacts associated with direct and indirect development of a floodplain.	Potentially applicable	This requirement may be applicable to any remedial action for the Ford Property and the North Surface Water Body. Mitigative measures would be taken to minimize any adverse impacts.
Governor's Executive Order 82-19	Floodplain	Potential effects of actions taken in a floodplain should be evaluated to avoid adverse impacts.	Potentially applicable	This requirement may be applicable to any remedial action for the Ford Property and the North Surface Water Body. Mitigative measures would be taken to minimize any adverse impacts.

Table 3-2 : Preliminary Identification of Potential Location-Specific ARARs and TBC Criteria

Citation	Location	Requirement	Preliminary Determination	Remarks
Clean Water Act (33 USC 1251-1376); Disposal Sites, Specifications(40 CFR 230), Dredged or Fill Material Discharges (Section 404 Program); Definitions, Exempt Activities Not Requiring Permits (40 CFR 232); State Program Regulations (40 CFR 233); General Regulatory Policies (33 CFR 320); Nationwide Permits (33 CFR 330)	Wetland	Dredge or fill material is not to be discharged into a wetland (as defined by the U.S. Army Corps of Engineers) without a permit.	Potentially applicable	This requirement would be applicable to any off-site borrow area if the location selected contained any wetlands or if the borrow activities could indirectly impact wetlands. No wetlands have been identified on-site.
Farmland Protection Policy Act (7 USC 4201 et seq.) Farmland Protection [7 CRF 658; 40 CFR 6.302(c)]	Farmland (prime, unique, or of state and local importance)	Federal agencies should take steps to ensure that federal actions do not cause U.S. farmland to be irreversibly converted to nonagricultural uses in cases in which other national interests do not override the importance of the protection of farmland or otherwise outweigh the benefits of maintaining farmland resources. Criteria developed by the U.S. Soil Conservation Service are to be used to identify and take into account the adverse effects of federal programs on farmland preservation. Federal agencies should consider alternative actions that could lessen adverse effects and should ensure that programs are compatible with state and local government and private programs and policies to protect farmland.	Potentially applicable	This requirement would be applicable for any potential soil borrow area off-site. Mitigative measures and restoration activities would also be conducted at any off-site borrow area, as appropriate, to minimize any adverse impacts to farmland.
RCRA Subtitle D (40 CFR Part 258 Subpart B) and MDNR Solid Waste Regulations (10 CSR 80-3.010 (4)(B)(1))	Proximity of solid waste landfills to the end of runways used for turbojet aircraft	Requires new or existing municipal solid waste landfills or lateral expansions that are located within 10,000 ft of any airport runway end used by turbojet aircraft to demonstrate that the units are designed and operated so that the MSWLF unit does not pose a bird hazard to aircraft.	Not applicable Potentially relevant and appropriate	As the OU-1 portion of the West Lake landfill closed in the 1970's and as none of the remedial alternatives under consideration include placement of additional solid waste, this requirement is not applicable. As some of the remedial alternatives include the potential to regrade existing solid waste, this requirement may potentially be relevant and appropriate.

Table 3-3 : Preliminary Identification of Potential Action-Specific ARARs and TBC Criteria

Citation	Action	Medium Requirement	Preliminary Determination	Remarks
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart A, Standards for the Control of Residual Radioactive Materials from Inactive Uranium Processing Sites	Radioactive waste disposal	Control of residual radioactive materials at designated uranium processing or depository sites should be designed to be effective for at least 200 years and up to 1,000 years, to the extent reasonably achievable. In addition, the control should be designed such that releases of radon-222 from the residual radioactive material would not exceed an average rate of 20 pCi/m ² -s or increase the annual average concentration in air outside the disposal site by more than 0.5 pCi/L. Because this standard applies to design, monitoring after disposal is not required to demonstrate compliance.	Not applicable but potentially relevant and appropriate in part	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. These regulations are applicable to uncontrolled areas whereas the current and future uses of Areas 1 and 2 are restricted. As OU-1 does contain radiologically impacted materials, these requirements may potentially be relevant; however, the radiologically impacted materials at the West Lake site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Although the waste materials are not similar to uranium tailings, the wastes do contain radium and thorium; therefore the longevity standard is potentially relevant and appropriate. As the radiologically-impacted materials do emit radon, the radon standard is potentially relevant and appropriate. As radiologically-impacted materials will remain on-site beyond the post-closure period for a solid waste landfill, longevity considerations should be factored into the cover design.
Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings (40 CFR 192), Subpart D, Standards for Management of Uranium Byproduct Materials Pursuant to Section 84 of the U.S. Atomic Energy Act of 1954, as amended; Subpart E, Standards for Management of Thorium Byproduct Materials Pursuant to Section 84 of the U.S. Atomic Energy Act of 1954, as amended.	Radioactive waste disposal	Disposal areas for uranium and thorium by-product materials should be designed to be effective for at least 200 years and up to 1,000 years, to the extent reasonably achievable. In addition the control should be designed so that releases of radon-222 and radon-220 from these materials (i.e., excluding the cover) would not exceed an average of 20 pCi/m ² -s. The standard applies to design, so monitoring for radon after installation of an appropriately designed cover is not required. (This requirement does not apply to any portion of the site that contains residual surface and subsurface concentrations of radium-226 and radium-228 at or below those identified in Subparts B and E, respectively, which were described under chemical-specific ARARs and TBCs.)	Not applicable but potentially relevant and appropriate in part	The West Lake Landfill OU-1 Site is not a designated Title I uranium mill tailings site; therefore, this requirement would not be applicable. These regulations are applicable to uncontrolled areas whereas the current and future uses of Areas 1 and 2 are restricted. As OU-1 does contain radiologically impacted materials, these requirements may potentially be relevant; however, the radiologically impacted materials at the West Lake site are a small fraction of an overall matrix of municipal solid waste, debris and fill materials. Although the waste materials at West Lake Site are not similar to uranium mill tailings, the wastes do contain radium and thorium; therefore the longevity standard is potentially relevant and appropriate. As the radiologically impacted materials will remain on-site beyond the 30-year post-closure period for a solid waste landfill, the 200/1000 year period, this standard is considered to be potentially relevant and appropriate.
Resource Conservation and Recovery Act (RCRA) Subtitle C	Hazardous waste management	Establishes standards for identification of and treatment, storage and disposal of hazardous wastes including hazardous wastes disposed in landfills.	Neither applicable nor relevant and appropriate	The radiologically impacted materials in Areas 1 and 2 do not meet the criteria for classification as hazardous wastes and therefore these requirements are not applicable. The radiologically impacted materials in Areas 1 and 2 are not similar to hazardous waste and therefore these requirements are not relevant and appropriate. The standards and design guidance for final covers may potentially be relevant; however, the Subtitle D standards are considered to be the appropriate criteria for final cover design.

Table 3-3 : Preliminary Identification of Potential Action-Specific ARARs and TBC Criteria

Citation	Action	Medium Requirement	Preliminary Determination	Remarks
Missouri Radiation Regulations; Protection Against Ionizing Radiation (19 CSR 20-10.090), Disposal of Radioactive Wastes	Radioactive waste disposal	Radioactive waste material should not be disposed of by dumping or burial in soil, except at sites approved by and registered with the Missouri Department of Health; a permit should be obtained for holding and preparation of such material prior to disposal; and no releases to air or water should cause exposure of any person above the limits specified in 10-CSR 20-10.041.	Potentially applicable to offsite disposal	Certain of these requirements would be applicable to offsite disposal if this were part of the selected remedial action.
Missouri Radiation Regulations; Protection Against Ionizing Radiation (19 CSR 20-10.070), Storage of Radioactive Materials	Radioactive waste storage	Radioactive materials should be stored in a manner that will not result in the exposure of any person, during routine access to a controlled area, in excess of the limits identified in 19 CSR 20-10.040 (see related discussion for contaminant-specific requirements); a facility used to store materials that may emit radioactive gases or airborne particulate matter should be vented to ensure that the concentration of such substances in air does not constitute a radiation hazard; and provisions should be made to minimize hazards to emergency workers in the event of a fire, earthquake, flood, or windstorm.	Potentially applicable	These requirements would be applicable to the temporary storage of radiologically-impacted soils that might be generated during any remedial action.
Solid Waste Disposal Act, as amended (42 USC 6901, et seq.); Criteria for Municipal Solid Waste Landfills (40 CFR 258), Subpart F, Closure and Post-Closure Care	Solid waste disposal	Criteria for closure of a landfill unit and post-closure care requirements are specified. Cover system design requirements at closure include (1) an infiltration layer constructed of a minimum of 18 in. of earthen material with a permeability less than or equal to the permeability of the bottom liner system or no greater than 1×10^{-5} cm/s, whichever is less, and (2) an erosion protection layer of earthen material capable of supporting native plant growth; or equivalents approved by the director of an approved state program. Post-closure care requires maintenance of the integrity of the final cover system, the leachate collection system, groundwater monitoring, and gas monitoring for a period of 10 years or as necessary to protect human health and the environment. Management of the leachate may be terminated if the owner/operator demonstrates that leachate no longer poses a threat to human health and the environment.	Neither applicable nor relevant and appropriate	Neither applicable nor relevant and appropriate as solid waste landfills in Missouri are regulated by the Missouri solid waste regulations.
Missouri Solid Waste Rules (10 CSR 80), Chapter 3, Sanitary Landfills, 3.010(17), Cover	Solid waste disposal	The landfill should be covered to minimize fire hazard, infiltration of precipitation, odors and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance. Final slope of the top shall be a minimum of 5%. No slopes shall ever exceed 33 1/3 % and slopes shall not exceed 25% without a detailed slope stability analysis. The final cover should be at least 2 ft of compacted clay with a permeability of 1×10^{-3} cm/sec or less overlain by 1 ft of soil capable of supporting vegetative growth.	Only applicable if Areas 1 or 2 are re-opened to accept additional solid wastes. Potentially relevant and appropriate for design of a new landfill cover.	These requirements are not applicable as they only apply to landfills in operation after 10-9-91. These requirements would be applicable to addition of new waste material to Areas 1 and 2 if such an activity is included as part of a remedial alternative. The requirements for final slopes and cover design are potentially relevant and appropriate to the design of an upgraded landfill cover for Areas 1 and 2.

Table 3-3 : Preliminary Identification of Potential Action-Specific ARARs and TBC Criteria

Citation	Action	Medium Requirement	Preliminary Determination	Remarks
Missouri Solid Waste Rules (10 CSR 80), Chapter 4, Demolition Landfills, 4.010(17), Cover	Solid waste disposal	The landfill should be covered to minimize fire hazard, infiltration of precipitation, odors and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance. Final slope of the top shall be a minimum of 5%. No slopes shall ever exceed 33 1/3 % and slopes shall not exceed 25% without a detailed slope stability analysis. The final cover should be at least 2 ft of compacted clay with a permeability of 1×10^{-5} cm/sec or less overlain by 1 ft of soil capable of supporting vegetative growth.	Only applicable if Areas 1 or 2 are re-opened to accept additional solid wastes. Potentially relevant and appropriate for design of a new landfill cover.	These requirements are not applicable as they only apply to landfills in operation after 10-9-91. These requirements would be applicable to addition of new waste material to Areas 1 and 2 if such an activity is included as part of a remedial alternative. The requirements for final slopes are potentially relevant and appropriate to the design of an upgraded landfill cover for Areas 1 and 2.
Closure and Post-Closure Plan Laidlaw Waste Systems (Bridgeton), Inc. Sanitary Landfill, December 1996, Revised September 1997	Landfill cover	Sets out closure and post-closure procedures for the West Lake Landfill, in particular, the final cover, grading and vegetation plan.	Potential TBC	Sets out the procedures to be used at the landfill to comply with the MDNR Solid Waste Regulations. This document should be considered in the design and construction of any cover system or drainage improvements that may be constructed for Areas 1 and 2 or if additional waste materials are placed in these areas as part of a remedial action. This document will also need to be considered if any regarding and/or landfill cover improvements are implemented for Areas 1 or 2.
Noise Control Act, as Amended; Noise Pollution and Abatement Act	Construction activities	The public should be protected from noises that jeopardize human health or welfare.	Potentially applicable	These requirements would be applicable to any remedial action.

Table 4-1: Groundwater Monitoring Parameters

Constituent	UMTRA 40 CFR 192.02	MDNR 10 CSR 80-3	OU-1 Anticipated Groundwater Monitoring Program	Notes
Radionuclides				
Combined radium-226 and radium-228	x		x	
Combined uranium-226 and uranium-228	x		x	
Gross alpha (excluding radon and uranium)	x			
Isotopic thorium			x	
Inorganics				
Ammonia		x	x	
Antimony		x	x	
Arsenic	x	x	x	
Barium	x	x	x	
Beryllium		x	x	
Boron		x	x	
Cadmium	x	x	x	
Calcium		x	x	
Chromium	x	x	x	
Cobalt		x	x	
Copper		x	x	
Fluoride		x	x	
Hardness		x	x	
Lead	x	x	x	
Magnesium		x	x	
Manganese		x	x	
Mercury	x	x	x	
Molybdenum	x		x	
Nickel		x	x	
Nitrate/Nitrite	x	x	x	
Phosphorus		x	x	
Selenium	x	x	x	
Silver	x	x	x	
Sodium		x	x	
Sulfate		x	x	
Thallium		x	x	
Total Organic Carbon (TOC)		x	x	
Vanadium		x	x	
Zinc		x	x	

Table 4-1: Groundwater Monitoring Parameters (continued)

Constituent	UMTRA 40 CFR 192.02	MDNR 10 CSR 80-3	OU-1 Anticipated Groundwater Monitoring Program	Notes
Organics				
Acetone		x	x	
Acrylonitrile		x	x	
Benzene		x	x	
Bromochloromethane		x	x	
Bromodichloromethane		x	x	
Bromoform		x	x	
Carbon disulfide		x	x	
Carbon tetrachloride		x	x	
Chlorobenzene		x	x	
Chloroethane		x	x	
Chloroform		x	x	
Dibromochloromethane		x	x	
DBCP		x	x	
EDB		x	x	
o-Dichlorobenzene		x	x	
p-Dichlorobenzene		x	x	
trans-1,4-Dichloro-2-butene		x	x	
1,1-Dichloroethane		x	x	
1,2-Dichloroethane		x	x	
1,1-Dichloroethylene		x	x	
cis-1,2-Dichloroethylene		x	x	
trans-1,2-Dichloroethylene		x	x	
1,2-Dichloropropane		x	x	
cis-1,3-Dichloropropene		x	x	
trans-1,3-Dichloropropene		x	x	
Ethylbenzene		x	x	
2-Hexanone		x	x	
Methyl bromide		x	x	
Methyl chloride		x	x	
Methylene bromide		x	x	
Methylene chloride		x	x	
Methyl ethyl ketone		x	x	
Methyl iodide		x	x	
4-Methyl-2-pentanone		x	x	
Styrene		x	x	
1,1,1,2-Tetrachloroethane		x	x	
1,1,2,2-Tetrachloroethane		x	x	
Tetrachloroethylene		x	x	
Toluene		x	x	
1,1,1-Trichloroethane		x	x	
1,1,2-Trichloroethane		x	x	
Trichloroethylene		x	x	
Trichlorofluoromethane		x	x	
1,2,3-Trichloropropane		x	x	
Vinyl acetate		x	x	
Vinyl Chloride		x	x	
Xylenes		x	x	
Pesticides				
Endrin	x			Never detected at Site, not proposed for inclusion.
Lindane	x			Never detected at Site, not proposed for inclusion.
Methoxychlor	x			Never detected at Site, not proposed for inclusion.
Toxaphene	x			Never detected at Site, not proposed for inclusion.
2,4-D	x			Never detected at Site, not proposed for inclusion.
2,4,5-TP Silvex	x			Never detected at Site, not proposed for inclusion.

Table 6-1: Comparative Analysis of Alternatives

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L1: No Action	<p>Protective of human health under current conditions assuming the existing institutional controls are monitored and enforced and the disposal areas are monitored and maintained, but not for potential future uses of the Site.</p> <p>Under No Action, existing land use restrictions would remain in effect.</p> <p>BRA evaluations indicate current conditions do not pose unacceptable risk. Future use of the Areas 1 and 2 could pose an unacceptable risk and therefore the No Action alternative is not protective of public health and the environment.</p>	<p>No Action may not meet all chemical-specific ARARs (e.g., Radon NESHAP and radium MCL).</p> <p>No action would meet the location- specific ARARs.</p> <p>The No Action alternative does not meet the containment goals or action-specific ARARs (Subtitle D landfill closure standards) of the presumptive remedy approach.</p>	<p>Institutional controls would not be monitored or maintained and the disposal areas would not be monitored and maintained.</p> <p>Future uses of Areas 1 and 2 could result in potential risk levels to onsite workers at the upper end or slightly above the generally accepted risk range used by EPA. Therefore, no action is not expected to be effective over the long-term.</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>No short-term impacts.</p> <p>The RAOs of (1) exposure to radiation above health-/risk-based levels; (2) minimizing infiltration; (3) controlling surface water runoff and erosion; and (4) controlling radon and landfill gas from Areas 1 and 2 would not be met.</p>	<p>No implementability issues.</p>	<p>No capital costs.</p> <p>O&M: \$20,000 to 25,000 every 5 years for 5-Year Review.</p> <p>Present Worth: \$47,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L2: Cover Repair and Maintenance, Additional Access Restrictions, Additional Institutional Controls, and Monitoring	<p>BRA evaluations indicate current conditions do not pose unacceptable risk. Future use of the Areas 1 and 2 would pose an unacceptable risk.</p> <p>This alternative includes monitoring, access controls (fencing), institutional controls, and maintenance of the landfill cover to restrict future uses to only those uses that would be protective of public health and the environment.</p> <p>Use of institutional controls as an alternative to engineered measures is inconsistent with NCP expectations and presumptive remedy approach to municipal landfill sites and therefore is not considered to be protective.</p>	<p>Would meet some but may not meet all chemical-specific ARARs (Radon NESHAP and radium MCL).</p> <p>L2 would meet the location-specific ARARs.</p> <p>Implementation of additional access restrictions and institutional controls would meet the location-specific ARARs.</p> <p>The additional access restrictions, additional institutional controls and monitoring and existing cover maintenance alternative does not meet the containment goals or action-specific ARARs (Subtitle D landfill closure standards) of the presumptive remedy approach.</p>	<p>Long-term effectiveness and permanence is increased by ongoing monitoring and maintenance of the existing cover, as the cover reduces the potential for erosion by wind or water, eliminates ponding and reduces resultant infiltration.</p> <p>Relies on monitoring and maintenance of existing and implementation of additional deed restrictions and institutional controls for long-term effectiveness, which would not meet EPA's preference for engineering controls and permanence.</p> <p>No actions would be taken to stabilize the physical integrity of the disposal areas.</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>No short-term impacts.</p> <p>RAO of preventing exposure above health-/risk-based levels would be met immediately upon implementation of the amendment to the access and deed restrictions and installation of additional fencing. RAOs of minimizing infiltration; controlling surface water runoff and erosion; and controlling radon and landfill gas emissions from Areas 1 and 2 would not be completely met</p>	<p>No implementability issues.</p>	<p>Capital: \$890,000</p> <p>Annual O&M: \$240,000 to 260,000</p> <p>Present Worth: \$3,900,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L3: Soil Cover to address gamma exposure and erosion potential	<p>Protective of human health and environment.</p> <p>BRA evaluations indicate current conditions do not pose unacceptable risk. Potential future use of Areas 1 and 2 could pose an unacceptable risk that would be addressed by placement of the soil cover over the landfill and implementation, monitoring and enforcement of existing and additional access and institutional controls.</p> <p>A soil cover would prevent direct contact with surface soil, eliminate potential for wind-blown dust and storm-water/snowmelt erosion of surface materials and subsequent transport, and reduce potential infiltration.</p>	<p>Should meet all chemical-specific ARARs.</p> <p>As no activities would occur that would affect potential location-specific ARARs for archeological resources, endangered species, floodplain, or wetlands, these ARARs would be met by the soil cover alternative. Impact to wetlands or farmland is not expected at any borrow source.</p> <p>Missouri Radiation Regulations and Noise Control Act action-specific ARARs require monitoring prior to placement of soil cover and limit amount of noise that could occur. Missouri Solid Waste Regulations include standards for final cover over landfills (slope angles, thickness, and engineering properties). These standards would not be met by this alternative.</p>	<p>All current or future risks should be within the EPA-accepted risk range of 10^{-4} to 10^{-6}.</p> <p>Soil cover would eliminate or reduce potential for exposure from gamma exposure, inhalation of radon gas or dust containing radionuclides or other constituents, dermal contact with impacted materials, and incidental ingestion of soil containing radionuclides or other chemicals pathways.</p> <p>Since L3 would not necessarily be designed to restrict infiltration and prevent leaching to groundwater or subsurface migration of radon and landfill gas, it may not be effective in preventing migration or exposure via all of the identified pathways.</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>Short-term impact to the community and workers would be minimal during construction of soil cover.</p> <p>Cover installation would require workers and equipment that would initially disturb the soil.</p> <p>Dust control measures would probably be required. Installation of cover will probably destroy habitats, forcing wildlife to migrate to other areas.</p> <p>All RAOs except minimizing infiltration would be met immediately upon construction of soil cover.</p>	<p>Technically feasible.</p> <p>Because Areas 1 and 2 are within a larger area in an existing landfill, it may be difficult to design and construct soil cover over the steeper slopes along the margin of Area 2.</p> <p>Implementability will be influenced by availability and location of offsite soil borrow sources.</p> <p>Will probably require coordination with final cover requirements for existing sanitary landfill.</p>	<p>Capital: \$8,400,000</p> <p>Annual O&M: \$20,000 to 200,000</p> <p>Present Worth: \$9,800,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L3: Soil Cover to address gamma exposure and erosion potential (continued)			Permanence would be improved with long-term cover maintenance and monitoring and enforcement of existing and additional access and institutional controls restricting uses and activities in Areas 1 and 2.				

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L4: Regrading of Areas 1 and 2 (2% minimum slope) and installation of Subtitle D Cover System	<p>Placement of additional soil fill or cutting/filling of existing materials, construction of an upgraded landfill cover and additional deed and access restrictions preventing ancillary uses of Areas 1 and 2 would be protective of human health and the environment.</p> <p>Construction of a new landfill cover would prevent direct contact with surface soil, eliminate potential for windblown dust and erosion of surface materials and subsequent transport, and reduce potential for infiltration and leaching to groundwater.</p>	<p>Would meet all chemical-specific ARARs.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, or wetlands, these ARARs would be met. Minimization of impacts to the floodplain would be addressed during design of the landfill regrading. Impact to wetlands or farmland is not expected at any borrow source.</p> <p>Missouri Radiation Regulations and Noise Control Act action-specific ARARs would be addressed by monitoring at the property boundaries. L4 would meet Missouri Solid Waste Regulations for final cover thickness and engineering properties of cover materials; 2% slope would meet intent of providing sufficient slope for drainage, but would not meet prescriptive 5% slope requirement.</p>	<p>All current or future risks would be within the EPA-accepted risk range of 10^{-4} to 10^{-6}.</p> <p>Placement of additional fill material or cutting/filling of existing waste material and new landfill cover would eliminate exposure pathways.</p> <p>Permanence would be improved with long-term cover maintenance and additional access and institutional controls restricting uses and activities in Areas 1 and 2.</p> <p>The lower 2% slope under Alternative L4 would provide a greater degree of reliability against long-term erosion of the soil cover compared to the 5% slopes included in Alternative L5</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>Short-term impact to the community and workers would be minimal during regrading and construction of cover.</p> <p>Regrading would require workers and equipment that would initially disturb the soil. Dust control measures would probably be required.</p> <p>Regrading and installation of cover will probably destroy habitat, forcing wildlife to migrate to other areas.</p> <p>All RAOs would be met upon construction of cover systems. Alternative could take several years to implement.</p>	<p>Technically feasible. May be difficult to re-compact existing material if the cut/fill option were used for regrading.</p> <p>Because Areas 1 and 2 are within a larger area in an existing landfill, it may be difficult to design and construct separate independent cover systems for Areas 1 and 2.</p> <p>Implementability will be influenced by availability and location of offsite clean fill/soil borrow sources.</p> <p>Will require coordination with final cover requirements for existing sanitary landfill.</p>	<p>Soil fill option to achieve minimum slope of 2%:</p> <p>Capital: \$21,800,000</p> <p>Annual O&M: \$15,000 to 200,000</p> <p>Present Worth: \$23,100,000</p> <p>Cut/fill existing materials option to achieve minimum slope of 2%:</p> <p>Capital: \$20,500,000</p> <p>Annual O&M: \$15,000 to 200,000</p> <p>Present Worth: \$21,700,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L5: Regrading of Areas 1 and 2 (5% minimum slope) and installation of Subtitle D Cover System	<p>Placement of additional soil fill or cutting/filling of existing materials, construction of an upgraded landfill cover and additional deed and access restrictions preventing ancillary uses of Areas 1 and 2 would be protective of public health and the environment,</p> <p>Construction of a new landfill cover would prevent direct contact with surface soil, eliminate potential for windblown dust and erosion of surface materials and subsequent transport, and reduce potential for infiltration and leaching to groundwater.</p>	<p>Would meet all chemical-specific ARARs.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, or wetlands, these ARARs would be met. Minimization of impacts to the floodplain would be addressed during design of the landfill regrading. Impact to wetlands or farmland is not expected at any borrow source.</p> <p>Missouri Radiation Regulations and Noise Control Act action-specific ARARs require monitoring prior to regrading and limit noise that could occur at property boundaries. L5 would meet Missouri Solid Waste Regulation standards for final cover thickness, properties of cover materials, and 5% slope requirement.</p>	<p>All current or future risks would be within the EPA-accepted risk range of 10^{-4} to 10^{-6}.</p> <p>Placement of additional fill material or cutting/filling of existing waste material and new landfill cover would eliminate exposure pathways.</p> <p>Permanence would be improved with long-term cover maintenance and additional access and institutional controls restricting uses and activities in Areas 1 and 2.</p> <p>As compared to 2% slopes under L4, 5% slopes should provide a greater degree of reliability against possible subsidence and associated increased infiltration that could result from subsidence.</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>Short-term impact to the community and workers would be minimal during regrading and construction of cover.</p> <p>Regrading would require workers and equipment that would initially disturb the soil. Dust control measures would probably be required.</p> <p>Regrading and installation of cover will probably destroy habitat, forcing wildlife to migrate to other areas.</p> <p>All RAOs would be met upon construction of cover systems. Alternative could take several years to implement.</p>	<p>Technically feasible. May be difficult to re-compact existing filled material if the cut/fill option were used for regrading.</p> <p>Because Areas 1 and 2 are within a larger area in an existing landfill, it may be difficult to design and construct separate independent cover systems for Areas 1 and 2.</p> <p>Will require coordination with final cover req'mts for existing sanitary landfill.</p> <p>Implementability will be influenced by availability and location of offsite clean fill/soil borrow sources.</p>	<p>Soil fill option to achieve slope of 5%:</p> <p>Capital: \$24,600,000</p> <p>Annual O&M: \$15,000 to 200,000</p> <p>Present Worth: \$25,800,000</p> <p>Cut/fill existing materials option to achieve minimum slope of 5%:</p> <p>Capital: \$19,900,000</p> <p>Annual O&M: \$15,000 to 200,000</p> <p>Present Worth: \$21,100,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L6: Excavation of Material with Higher Levels of Radioactivity from Area 2 and regrading and installation of a Subtitle D cover system	<p>Placement of additional soil fill or cutting/filling of existing materials, construction of an upgraded landfill cover and additional deed and access restrictions preventing ancillary uses of Areas 1 and 2 would be protective of public health and the environment.</p> <p>Construction of a new landfill cover would prevent direct contact with surface soil, eliminate potential for windblown dust and erosion of surface materials and subsequent transport, and reduce potential for infiltration and leaching to groundwater.</p> <p>Removal of materials with higher levels of radionuclides would lower the overall</p>	<p>Would meet all chemical-specific ARARs.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, or wetlands, these ARARs would be met. Minimization of impacts to the floodplain would be addressed during design of the landfill regrading. Impact to wetlands or farmland is not expected at any borrow source.</p> <p>Missouri Radiation Regulations and Noise Control Act action-specific ARARs would require monitoring during removal of material, landfill regrading and landfill cover construction and limit the amount of noise that could occur at the property boundaries.</p> <p>Depending upon the slope angle chosen, this alternative would meet Missouri Solid Waste</p>	<p>All current or future risks would be within the EPA-accepted risk range of 10^{-4} to 10^{-6}.</p> <p>Placement of additional fill material or cutting/filling of existing waste material and new landfill cover would eliminate exposure pathways.</p> <p>Permanence would be improved with long-term cover maintenance and additional access and institutional controls restricting uses and activities in Areas 1 and 2.</p> <p>Excavation of materials in Area 2 with higher levels of radioactivity would potentially reduce the overall magnitude of residual risk posed by the radiologically-impacted materials. However, as radiologically-</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>Removal, transport, and disposal of material with higher levels of radioactivity would result in short-term impacts and potential risks to onsite workers and the community including offsite truck and rail transport accidents, odor issues, and potential short-term impacts associated with worker exposure during excavation of soil and segregation of soil that is dispersed in other wastes.</p> <p>Excavation of soil and subsequent backfill would require workers and equipment that would disturb</p>	<p>Technically feasible in general.</p> <p>Technical implementability issues:</p> <ul style="list-style-type: none"> Excavation of large volume of landfilled materials. Addressing odor associated with excavating refuse. Segregation/screening of soil that is dispersed in other wastes.. Transfer of debris/soil from trucks to railcars. <p>Administrative implementability issues:</p> <ul style="list-style-type: none"> Transfer of radiologically impacted soil out of state. 	<p>Capital: \$75,100,000 (for soil fill option to achieve slope of 5%)</p> <p>Annual O&M: \$15,000 to 200,000</p> <p>Present Worth: \$76,000,000</p> <p>Note: Both Capital and Present Worth costs for Alternative L6 are dependent upon the slope angle and regrading method chosen. Costs presented herein represent those for the soil fill option to achieve a slope of 5%.</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
L6 – Excavation of Material with Higher Levels of Radioactivity from Area 2 and regrading and installation of a Subtitle D cover system (continued).	amount of radiologically impacted materials at the site and the magnitude of residual risk. However, construction of an upgraded landfill cover and additional deed and access restrictions would be required for L6 to be protective of public health and the environment.	Regulation standards for final cover thickness, properties of cover materials, and either the intent of, or the 5% prescriptive limit for the final slope requirement.	impacted materials would still remain, removal of materials in Area 2 with higher levels of radioactivity in and of itself would not significantly improve the reliability or degree of control that would be achieved by installation and maintenance of a new landfill cover.		<p>the soil. Dust control measures would be required.</p> <p>All RAOs would be met upon construction of cover systems.</p> <p>Alternative could take several years to implement and would require extensive planning and permitting.</p>	<ul style="list-style-type: none"> Only a very limited number of offsite disposal options exist. Securing a fair and reasonable unit price for disposal of impacted soil at a licensed offsite facility. 	

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
F1: No Action	May be protective of human health under current conditions; however, uncertainty regarding the disposition of the soil piles created by prior grading by AAA Trailer necessitates an assumption that impacted soil above standards for unrestricted use may still be present. Therefore, this alternative would not be protective of human health and the environment.	<p>Presuming impacted soil still remains on Lot 2A2 and/or the buffer zone, No Action would not meet the UMTRA chemical-specific ARARs for cleanup of soil on adjacent properties.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, floodplain or wetlands, these ARARs would be met.</p> <p>Would not meet the UMTRA standards for cleanup of land to unrestricted use standards.</p>	<p>The calculated human health risks to a potential current or future receptor working in buffer zone/Lot 2A2 were determined to be within the generally accepted risk range of 10^{-4} to 10^{-6} used by EPA; however, the uncertainty regarding the levels and extent of radionuclides that may remain in the soil created by the most recent grading by AAA Trailer necessitates an assumption that impacted soil above standards for unrestricted use may still be present.</p> <p>If soil containing radionuclides at levels above those for unrestricted use are still present on these properties, this alternative would neither be effective nor permanent.</p>	There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.	Presuming that soil containing radionuclides at levels above standards for unrestricted use are still present on these properties, the RAO of preventing exposure to radiation above health-/risk-based levels would not be met.	<p>This alternative would require a soil sampling program to assess the current conditions of radionuclide occurrences on Lot 2A2 and the buffer zone.</p> <p>Performance of soil sampling would require the cooperation of and a granting of access by the current owner and possibly lessee of Lot 2A2.</p>	<p>Capital: \$160,000</p> <p>No annual O&M costs</p> <p>Present Worth: \$160,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
F2: Institutional and Access Controls	<p>May be protective of human health under current conditions; however, uncertainty regarding the disposition of the soil piles created by prior grading by AAA Trailer necessitates an assumption that impacted soil above standards for unrestricted use may still be present.</p> <p>Additional deed restrictions preventing unrestricted use of these properties would limit but not necessarily eliminate potential for exposure to soil containing radionuclides above acceptable risk-based levels.</p> <p>Use of institutional controls as an alternative to engineered measures is inconsistent with NCP expectations.</p>	<p>Presuming impacted soil still remains on Lot 2A2 and/or the buffer zone, No Action would not meet the UMTRA chemical-specific ARARs for cleanup of soil on adjacent properties.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, floodplain or wetlands, these ARARs would be met.</p> <p>Would not meet the UMTRA standards for cleanup of land to unrestricted use standard.</p>	<p>The calculated human health risks to a potential current or future receptor working in buffer zone/Lot 2A2 were determined to be within the generally accepted risk range of 10^{-4} to 10^{-6} used by EPA; however, the uncertainty regarding the levels and extent of radionuclides that may remain in the soil created by the most recent grading by AAA Trailer necessitates an assumption that impacted soil above standards for unrestricted use may still be present.</p> <p>This alternative relies on implementation of deed restrictions to eliminate potential exposures rather than engineered measures and therefore is not considered permanent.</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>No short-term impacts.</p> <p>RAO of preventing exposure to radiation above health-/risk-based levels would be met immediately upon implementation of additional deed restrictions.</p>	<p>Implementation of deed restrictions will require consent of owner(s) of Crossroad Lot 2A2.</p> <p>This alternative would require a soil sampling program to assess the current conditions of radionuclide occurrences on Lot 2A2 and the buffer zone.</p> <p>Performance of soil sampling would require the cooperation of and a granting of access by the current owner and possibly lessee of Lot 2A2.</p>	<p>Capital: \$210,000</p> <p>Annual O&M: \$6,000 to 14,000</p> <p>Present Worth: \$290,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
F3: Capping and Institutional and Access Controls	<p>Uncertainty regarding the disposition of the soil piles created by prior grading by AAA Trailer would be addressed by capping and institutional controls which would prevent direct exposure to radionuclides. Therefore, this alternative would be protective of human health and the environment.</p> <p>Capping would prevent direct contact with surface soil, eliminate potential for windblown dust and stormwater/snowmelt erosion of surface materials and subsequent transport.</p>	<p>Presuming impacted soil still remains on Lot 2A2 and/or the buffer zone, No Action would not meet the UMTRA chemical-specific ARARs for cleanup of soil on adjacent properties.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, or wetlands, these ARARs would be met. Minimization of impacts to the floodplain would be addressed during design of the cap.</p> <p>May not meet the UMTRA standards for cleanup of land to unrestricted use standard. Missouri Radiation Regulations and Noise Control Act action-specific ARARs would require monitoring prior to placement of soil cover and limit amount of noise that could occur at the property boundaries.</p>	<p>All current or future risks would be within the generally accepted risk range of 10^{-4} to 10^{-6}.</p> <p>Placement of a gravel, asphalt or other cap would eliminate exposure pathways.</p> <p>Permanence would be improved with long-term cap maintenance and institutional controls restricting future uses and activities to industrial/commercial uses.</p>	<p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>Short-term impact to the community and workers would be minimal during construction of the cap.</p> <p>Cap installation would require workers and equipment that would initially disturb the soil.</p> <p>Dust control measures would probably be required.</p> <p>All RAOs would be met immediately upon construction of soil cover.</p>	<p>Technically feasible.</p> <p>Will require consent of owner(s) of Crossroad Lot 2A2.</p>	<p>Capital: \$340,000</p> <p>Annual O&M: \$6,000 to 14,000</p> <p>Present Worth: \$420,000</p>

Table 6-1: Comparative Analysis of Alternatives (continued)

Alternative	Threshold Criteria		Primary Balancing Criteria				
	Overall Protection of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume	Short-Term Effectiveness	Implementability	Estimated Costs
F4: Soil Excavation and Consolidation in Area 2	<p>Protective of human health and environment.</p> <p>Excavation of radiologically-impacted soil and consolidation on Area 2 would address uncertainty regarding the disposition of the soil piles created by prior grading by AAA Trailer.</p> <p>Excavation of radiologically-impacted soil and consolidation on Area 2 would prevent direct contact with surface soil, eliminate potential for windblown dust and stormwater/snowmelt erosion of surface materials and subsequent transport.</p>	<p>Would meet all chemical-specific ARARs including UMTRA standards for unrestricted use.</p> <p>As no activities would occur that would affect potential location-specific ARARs regarding archeological resources, endangered species, or wetlands, these ARARs would be met. Minimization of impacts to the floodplain would be addressed during design of the soil removal action</p> <p>Missouri Radiation Regulations and Noise Control Act action-specific ARARs would require monitoring prior to soil excavation and limit amount of noise that could occur at the property boundaries.</p>	<p>All current or future risks would be within the generally accepted risk range of 10^{-4} to 10^{-6}.</p> <p>Excavation of soil above UMTRA standards would eliminate exposure pathways.</p> <p>Allows for unrestricted use of the property without institutional controls.</p> <p>No long-term O&M would be required under this alternative.</p>	<p>Would provide a reduction in toxicity, mobility and volume of radiologically-impacted material on the buffer zone and Crossroad Lot 2A2.</p> <p>There would be no reduction in contaminant toxicity, mobility or volume through treatment. Therefore, no treatment residuals would be generated.</p>	<p>Short-term impact to the community and workers would be minimal during soil excavation and consolidation.</p> <p>Soil excavation and consolidation would require workers and equipment that would disturb the soil.</p> <p>Dust control measures would probably be required.</p> <p>All RAOs would be met immediately upon completion of the soil excavation and consolidation activities.</p>	<p>Technically feasible.</p> <p>Will require consent of owner(s) and possibly lessee(s) of Crossroad Lot 2A2.</p> <p>This alternative would require a soil sampling program to assess the current conditions of radionuclide occurrences on Lot 2A2 and the buffer zone.</p> <p>Performance of soil sampling would require the cooperation of and a granting of access by the current owner and possibly lessee of Lot 2A2.</p>	<p>Capital: \$600,000</p> <p>Annual O&M: \$0</p> <p>Present Worth: \$600,000</p>